Aakash

Medical | IIT-JEE | Foundations

KNOWLEDGE BYTES

APRIL 2025

CLASS 10

Aakash

Medical | IIT-JEE | Foundations

Edition: 2025-26

PREFACE

What is Knowledge Bytes?

Knowledge Bytes is a collection of riddles, interesting facts, mnemonics and puzzles that will make your learning fun and engaging.

We want you to be delighted about studying. Knowledge Bytes helps you to know more about the subject in a fun, motivating and educational way and helps to implement what you learn in a creative way.

Benefits


Saves Time


Develops Learning Skills


Stimulates Interest


Leads to Increased Comprehension

EXPLORE

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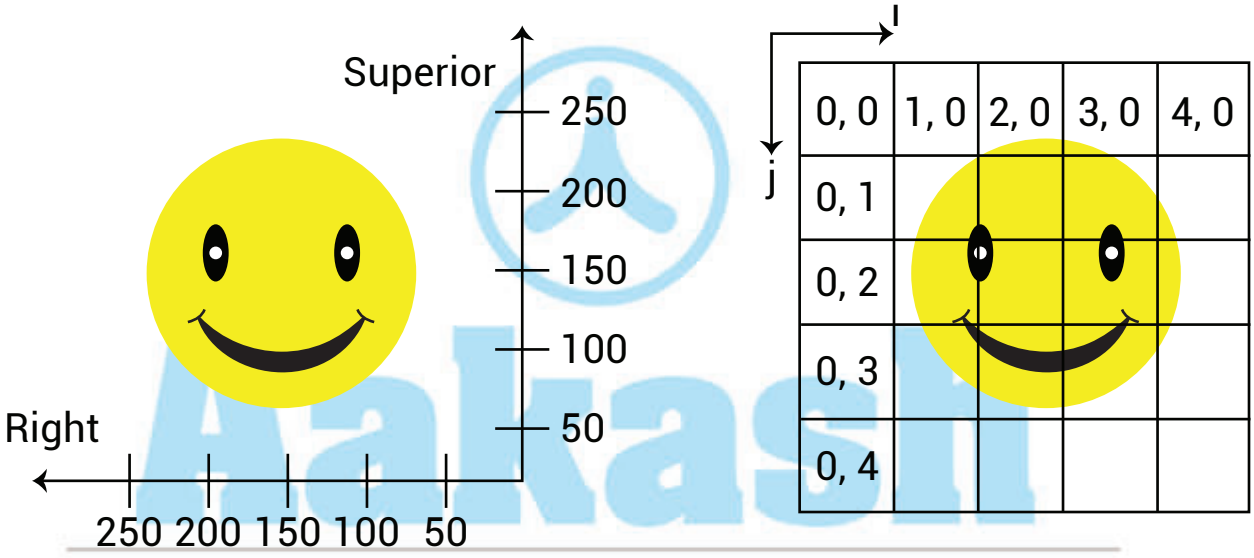
Coordinate Geometry and Its Usefulness in Daily Life

1. Digital World

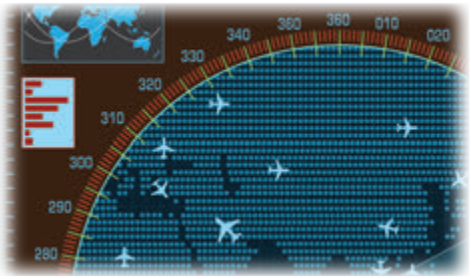
Drawing any figure or editing image in computer is again a field where concepts of coordinate geometry are used.



2. Location of Air Transport

It's a tool which will answer our following questions :-

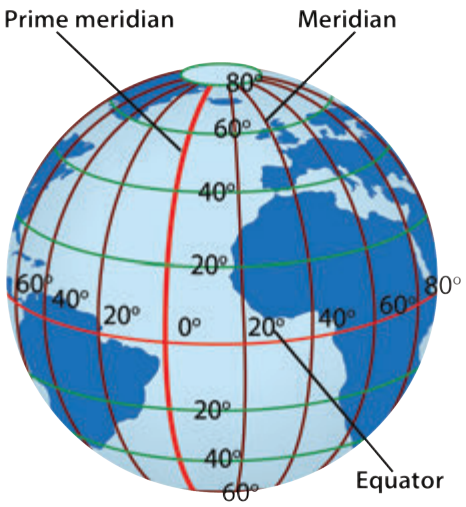
What is the current location of aircraft?



How much time is required from one place to another travelling at certain speed? And many others.

3. Latitude and Longitude

For the real world locations, describing the accurate location and shape of features will require a coordinate framework. So for this purpose, a special coordinate system called geographical coordinate system is used to assign geographic locations of objects.

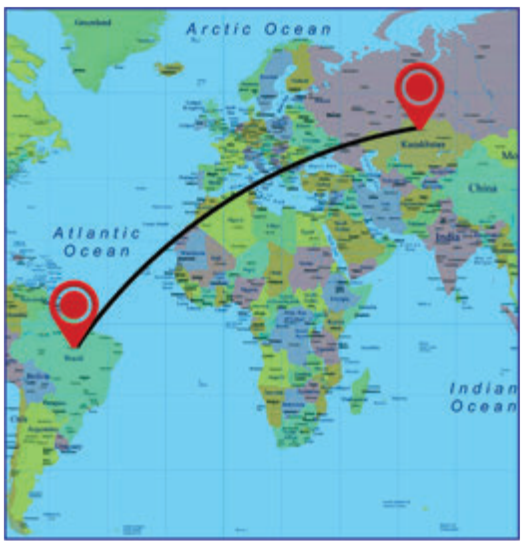


4. Predicting Weather Forecast

In real life, when weather forecasters are tracking hurricanes, they note the absolute location on a periodic basis to see the path of the storm and try to predict the future path based partially on these findings.

5. GPS System

In a GPS, the longitudes and the latitudes of a place are its coordinates. The distance formula is used to find the distance between 2 places in GPS.



Area of Triangle in Determinant Form

Let $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$ are the vertices of a triangle, then area of Δ ABC is given by

$$\Delta = \frac{1}{2}\left\| \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} \right\|$$

Inside '| |' ⟶ symbol for determinant

Outside '| |' ⟶ symbol for modulus

Determinant given above is expanded as:

$$\Delta = \frac{1}{2}\begin{vmatrix} C_1 & C_2 & C_3 \\ + & - & + \\ x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} \begin{matrix} \\ \\ R_1 \\ R_2 \\ R_3 \end{matrix}$$

3 Rows
3 Columns

Expanding along Row 1:

$$\Delta = \frac{1}{2}\left| x_1(y_2 - y_3) - y_1(x_2 - x_3) + (x_2y_3 - x_3y_2) \right|$$

$$\Delta = \frac{1}{2}\left| x_1(y_2 - y_3) - y_1x_2 + y_1x_3 + x_2y_3 - x_3y_2 \right|$$

$$\Delta = \frac{1}{2}\left| x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2) \right|$$

where | | represents modulus or absolute value

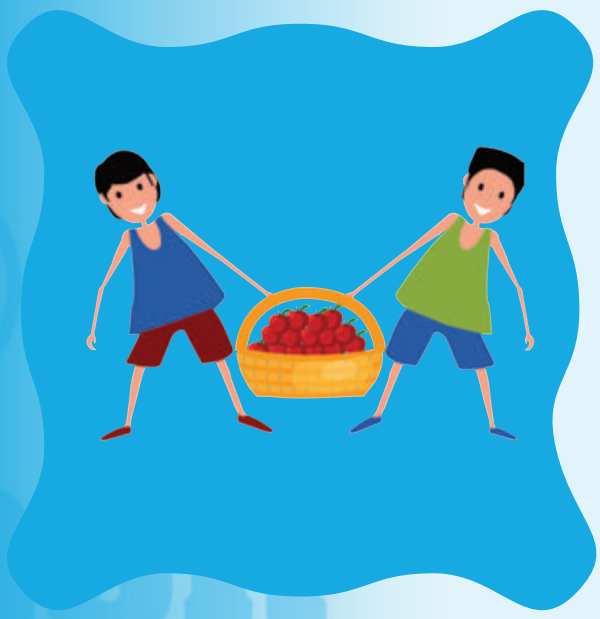
Condition for collinearity

$$\Delta = \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = 0$$

When the points are collinear, area of $\Delta = 0$

Riddle

A bag of Apples was divided between Harsh and Atharv. Atharv said, “This is not fair! You have 3 times as many Apples I have." Harsh said, "OK, I will give you one Apple for each year of your age." Atharv replied, "Still not fair. Now, you have twice as many Apples as I have." “Now, that's fair enough as I am twice older than you", said Harsh. Harsh went to Kitchen to drink juice. While he was in Kitchen, Atharv took Apples from Harsh's pile equal to Harsh's age. Who has more Apples now?



Solutions

Answer (Riddles)

1. Let Atharv had initially 'k' apples so Harsh had '3k' apples initially.

   Suppose Atharv's age is 'n' years according to the statement Harsh's age is '2n'

   Now, Atharv has k + n apples

   Harsh has 3k – n apples

   According to Question :

   $$3k - n = 2(k + n)$$

   $$k = 3n$$

   Again Atharv took Apples from Harsh's pile equal to Harsh's age

   Finally Atharv has $k + n + 2n = k + 3n$

   and Harsh has $3k - n - 2n = 3k - 3n$

   Substitute $k = 3n$

   Both have same number of Apples now.

Electricity

P.D. $= \frac{\text{WORK DONE}}{\text{CHARGE}}$

$V = \frac{W}{Q}$

Unit of V is Volt

OHM'S LAW

$V \propto I$

$V = RI$

Unit of R is Ohm

ELECTRIC ENERGY

Work $= \frac{V^2t}{R} = I^2Rt$

$= VIt$

Unit of EE is kWh

1 kWh $= 3.6 \times 10^6$ J

RESISTANCE

= P.D./CURRENT

$R = \frac{V}{I}$

ELECTRIC POWER

$P = \frac{\text{Work}}{\text{Time}}$ OR

$P = \frac{V^2}{R} = I^2R = VI$

Unit of P is Watt

RESISTIVITY

$\rho = \frac{RA}{L}$

Unit of resistivity is ohm-m

JOULE'S LAW

HEAT ENERGY (H) $= \frac{V^2t}{R}$

$= I^2Rt = VIt$

Unit of heat energy is joule

RESISTANCE IN SERIES

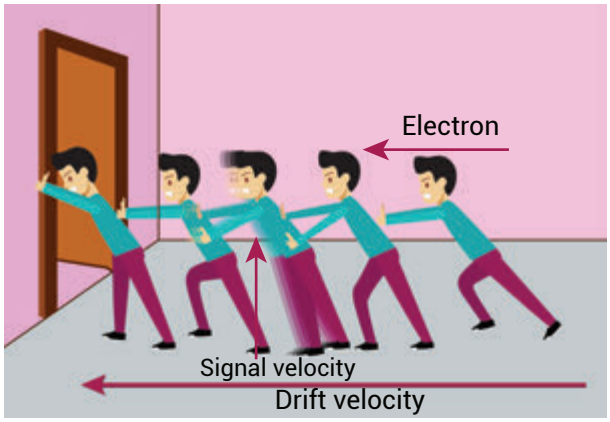
$R_s = R_1 + R_2 + R_3 \ldots\ldots R_n$

RESISTANCE IN PARALLEL

$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots \frac{1}{R_n}$

Fact 1 'Flow' of charges inside a wire

Electrons in the conductor move with a certain average 'drift velocity', this drift velocity of electrons for a typical copper wire carrying a small current is found to be actually very small, of the order of 1 mm/s.



How is it then that an electric bulb lights up as soon as we turn the switch on?

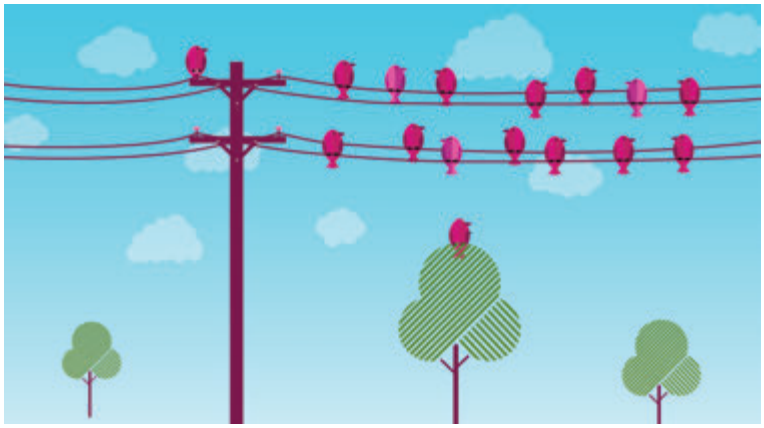
It is not that a current starts only when an electron from one terminal of the electric supply physically reaches the other terminal through the bulb, because the physical drift of electrons in the conducting wires is a very slow process.

The exact mechanism of the current flow, which takes place with a speed close to the speed of light, is fascinating, actually when an electric field is applied, electrons at all parts of the conductor start drifting. The electrons just near the negative terminal of the battery drifts, the electrons at the middle of the conductor drifts and the electrons near the positive end of the conductor also drifts. So, even if the drift velocity is the order of a few mm/s, the current flows at the velocity of the propagation of the electric field, which is the velocity of light.

This is why, when you switch ON the bulb, we observe that the bulb glows instantly.

Fact 2

Birds won't get electrocuted if they sit on one power line. But if they touch two lines simultaneously, the bird will essentially become a circuit as the electricity from one line flows through it to the other line, resulting in electrocution.



Fact 3

Do you know two same charged body can also attract each other if the charge on one body (Q_1) is much greater than that on the other (Q_2) and they are close enough to each other so that force of attraction between Q_1 and induced charge on the other exceeds the force of repulsion between Q_1 and Q_2. (This is not valid for particles.)

Fact 4

Wondering what actually a UFO- (Unidentified Flying Object) is ?

Most common answer – An Alien ship out of this world ?

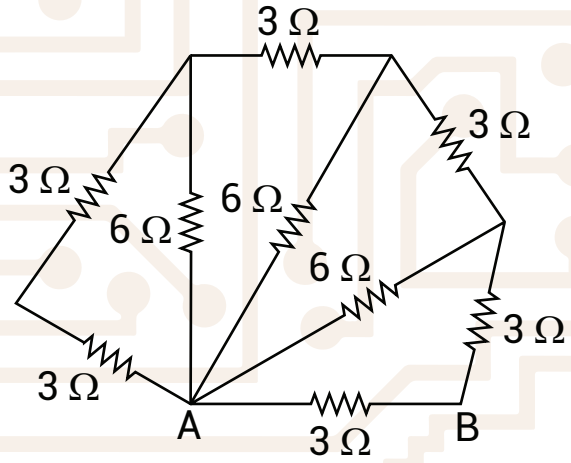
Actually electricity may be the force behind sightings of unidentified flying objects (UFOs). The fact is that what many have reported as UFOs have actually been static electrical charges on transmission lines that cause glowing corona discharges, giving the appearance of a bright flying object. So if you hear of a sighting near your area and it happens to be in the vicinity of a power plant static electricity is more than likely the culprit.

Fact 5

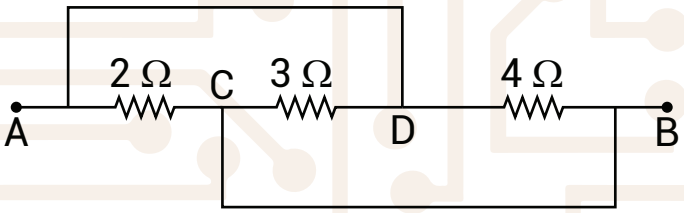
Alloys are used in heating elements which have higher resistance so when current flows through the heating element, it becomes too hot and glows red. But the cord of electric heater is usually made up of copper or aluminium which have very low resistance so it does not glow.

Thunderbolt

Circuit-I **Find the equivalent resistance between A and B.**

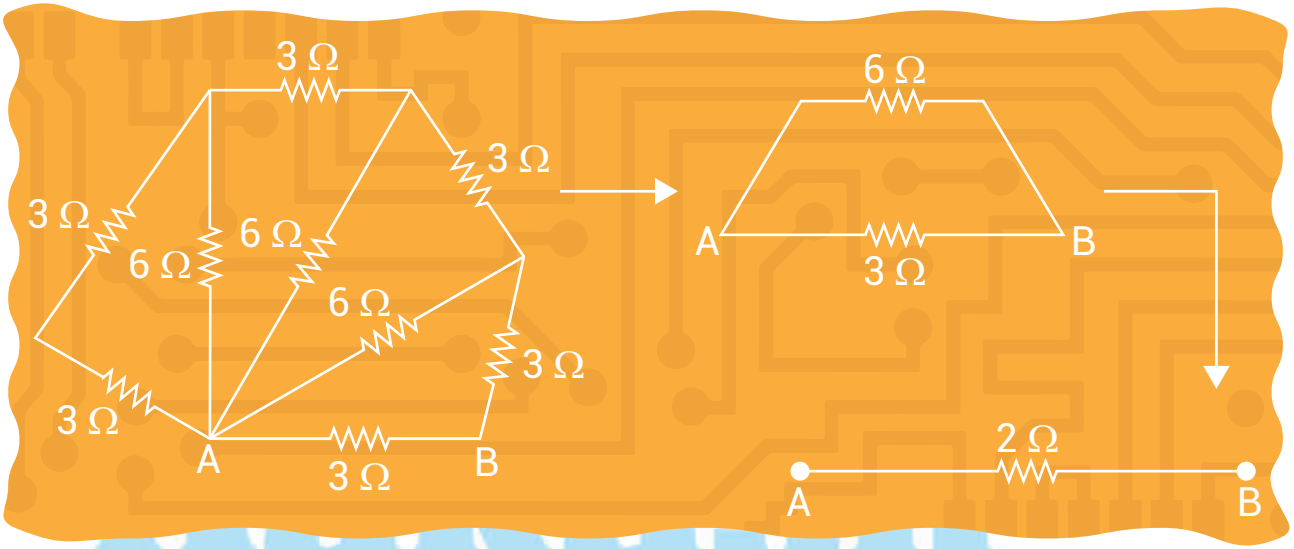


Circuit-II **Find the equivalent resistance between A and B.**



Answer (Thunderbolt)

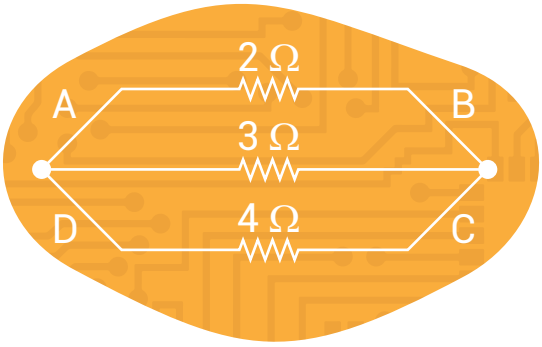
Circuit-I Reconstructed figure equivalent to given figure are given step by step as



Circuit-II The equivalent figure is given as

So, $\frac{1}{R_{eq}} = \frac{1}{2} + \frac{1}{3} + \frac{1}{4}$

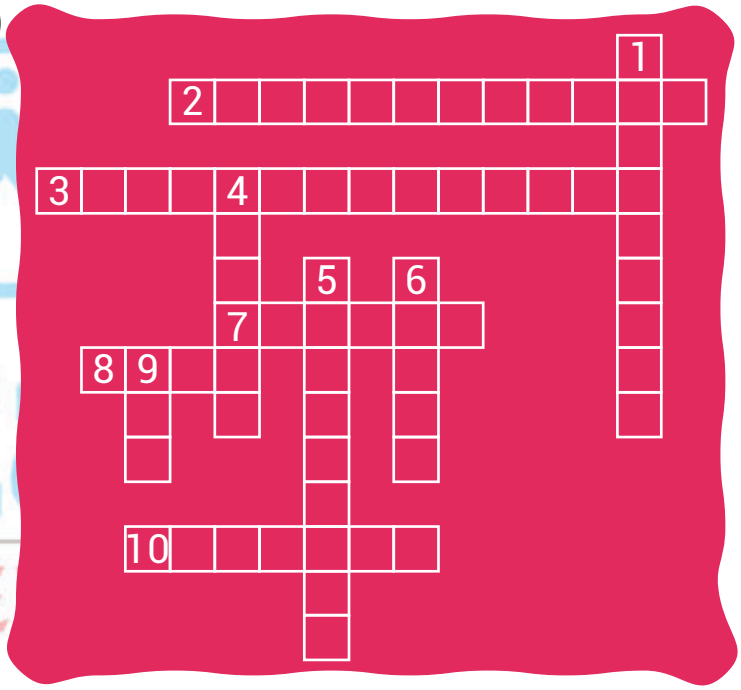
$R_{eq} = \frac{12}{13}\Omega$



Crossword Metals and Non-metals

Across

2. Method used to extract sodium. (12)
3. Gas that reduces oxide ores. (14)
7. Ore of lead. (6)
8. A form of carbon. (4)
10. Main ore of aluminium. (7)



Down

1. Another name of calcium carbonate (9)
4. Gas blown into molten iron to reduce its carbon content (6)
5. Metal used for making high-voltage electricity cables (9)
6. Argon is _____ in nature. (5)
9. Mineral which contains extractable metal (3)

Thermite Process

Thermite process is an important metallurgical process which is used to reduce metal oxide into metal with the help of more reactive metal.

This process is highly exothermic in which metals are obtained in molten state. Due to exothermic nature of process, it is used in

Thermite welding

Joining railway track

DID YOU KNOW?

Thermite process is also used for military purposes. It was used as incendiary bombs in World War II.

These bombs consisted of dozens of thin thermite-filled canisters (**bomblets**) which were ignited by a magnesium fuse. The bombs created massive damage in many cities due to fires started by the thermite. Cities that primarily consisted of wooden buildings were especially susceptible.

Metals : Blessing for The Human Body!!

Singing bowls were actually made with a combination of "seven sacred metals": gold, silver, copper, tin, iron, lead and mercury.

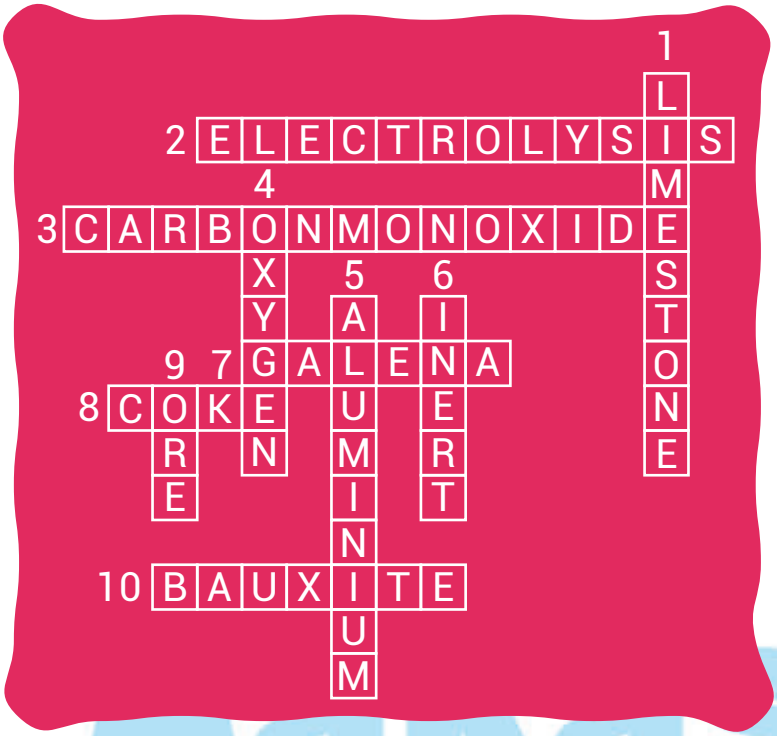
Singing bowl

Some metals were consecrated. Each metal believed to represent a heavenly body or a planet: Gold (Sun), Silver (Moon), Mercury (Mercury), Copper (Venus), Iron (Mars), Tin (Jupiter) and Lead (Saturn).

Metals were smelted and purified prior to being cast, reheated and hammered into different form.

Modern science shows that most bowls made from this range of metals actually can't sing very well. This explains why the Himalayan people eventually began making more simple bowls out of 80% copper and 20% tin.

Answer (Crossword)



Word Puzzle

How do Organisms Reproduce ?

1. It is a source of perennation rather than reproduction

2. Method of vegetative propagation that involves stock and scion

3. Mode of reproduction in *Hydra*

4. Method of reproduction common in *Amoeba* and *Plasmodium*

5. Individual of clone

6. Process required to maintain continuity of species

A	T	M	O	F	X	R	L	M	T	N	E	X	B
S	R	E	D	U	Q	P	W	O	Y	P	U	Q	U
P	S	G	Z	D	M	I	T	O	S	I	S	O	D
O	T	S	G	R	T	D	C	F	J	S	R	Q	D
R	E	M	R	O	X	M	O	R	T	S	H	T	I
U	G	W	A	I	F	E	R	A	M	E	T	O	N
L	T	B	F	Q	G	S	O	D	W	R	F	W	G
A	F	F	T	R	B	H	H	A	R	A	E	B	P
T	H	N	I	X	U	T	I	F	Z	B	X	R	Y
I	R	N	N	T	A	F	I	S	S	I	O	N	B
O	M	R	G	S	O	D	B	W	B	P	E	B	U
N	X	W	A	Q	R	T	M	F	R	A	Q	T	S
F	R	A	G	M	E	N	T	A	T	I	O	N	B
S	M	R	E	P	R	O	D	U	C	T	I	O	N

7. Type of cell division that occurs in somatic cells

8. *Spirogyra* reproduces by this method.

Riddles

1

Hint: I don't need seeds because I carry my baby buds on my leaves; Who am I?

2

Hint: You cut my stems & you squish out its juice. Cutting gives off roots when placed partly under moist soil and that's how I reproduce! Who am I?

3

Hint: I am a stem but I reproduce by my eyes. Who am I?

4

Hint: You cut me into pieces yet I grow a new me from each one. I may be a worm but I know this process!

5

Hint: I have false feet yet I can split in any direction. Who am I?

6

Hint: I make your bread spongy. How do I reproduce?

7

Hint: I'm the malarial parasite and I reproduce by dividing multiple times.

8

Hint: You detached me from one plant and tied me on another stem. What am I?

9

Hint: You grow me layer by layer & tie my flowers in your hair.

After solving all the above given puzzles, let us now solve the final puzzle by arranging the alphabets in the encircled boxes of the above puzzles.

?

To increase their number, all organisms do this!

Unscramble The Mysteries of Plant Cloning

1. NOSOTL _____

2. STOFEF _____

3. MOCR _____

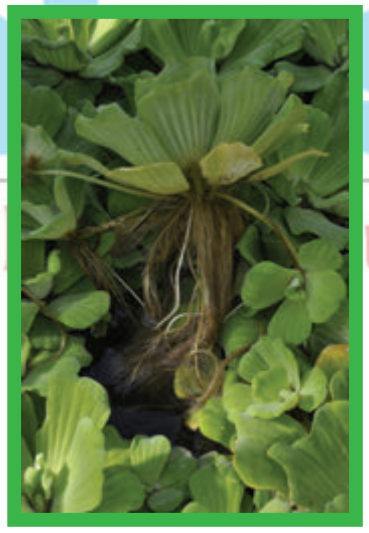
4. SIBBLUL _____

5. ZEMHIRO _____

6. RBUTE _____

Hint: Each of these is a method by which the following plants propagate vegetatively. Let's see how many of these you can guess correctly!

1. Strawberry



2. *Pistia*

3. *Colocasia*

4. Pineapple

6. Dahlia

5. Turmeric

Mnemonic

Mnemonics for remembering examples of underground stem ⇨ Corm

Coca Cola Freezed At Zero degree

- Coca → Corm
- Cola → *Colocasia*
- Freezed → *Freesia*
- At → *Amorphophallus*
- Zero → Zaminkand

For remembering examples of stolon & runner

Ram Can't Order Lots of Goods

- Ram → Runner
- Can't → *Centella*
- Order → *Oxalis*
- Lots → Lawn
- Goods → Grass

Answer (Word Puzzle)

A	T	M	O	F	X	R	L	M	T	N	E	X	B
S	R	E	D	U	Q	P	W	O	Y	P	U	Q	U
P	S	G	Z	D	M	I	T	O	S	I	S	O	D
O	T	S	G	R	T	D	C	F	J	S	R	Q	D
R	E	M	R	O	X	M	O	R	T	S	H	T	I
U	G	W	A	I	F	E	R	A	M	E	T	O	N
L	T	B	F	Q	G	S	O	D	W	R	F	W	G
A	F	F	T	R	B	H	H	A	R	A	E	B	P
T	H	N	I	X	U	T	I	F	Z	B	X	R	Y
I	R	N	N	T	A	F	I	S	S	I	O	N	B
O	M	R	G	S	O	D	B	W	B	P	E	B	U
N	X	W	A	Q	R	T	M	F	R	A	Q	T	S
F	R	A	G	M	E	N	T	A	T	I	O	N	B
S	M	R	E	P	R	O	D	U	C	T	I	O	N

Answer (Riddles)

1. BRYOPHYLLUM
2. SUGARCANE
3. POTATO
4. REGENERATION
5. AMOEBA
6. BUDDING
7. PLASMODIUM
8. SCION
9. JASMINE

REPRODUCE

Answer (Unscramble The Mysteries of Plant Cloning)

1. Stolon
2. Offset
3. Corm
4. Bulbils
5. Rhizome
6. Tuber

Ecological Conservation

DID YOU KNOW?

Asiatic Cheetah

Asiatic Cheetah (Acinonyx jubantus) also known as Iranian or Persian cheetah, is the fastest mammal on the earth. These were found once in India; however, with the increase in their hunting and habitat destruction it became extinct in India in 1952. Now it is only found in Iran, where it is critically endangered.

World Heritage Site

Nazca Lines

You must have heard about many arts, artefacts, drawings by the ancient people which always amazed us to the core and forced us to ask the question that how was it made and what technology they used etc... One such historic site we are talking about is

It is a group of very large geoglyphs made in the **Nazca Desert** in **Southern Peru**. These were created between 500BCE and 500CE by the people of Nazca.

The figures include simple lines and geometric shapes; more than 70 are zoomorphic designs including a hummingbird, spider, fish, condor, heron, monkey, lizard, dog and a human. It is commonly believed that these symbol had a religious significance to the people of Nazca.

One of the hypotheses about its purpose is to be seen by deities from the sky.

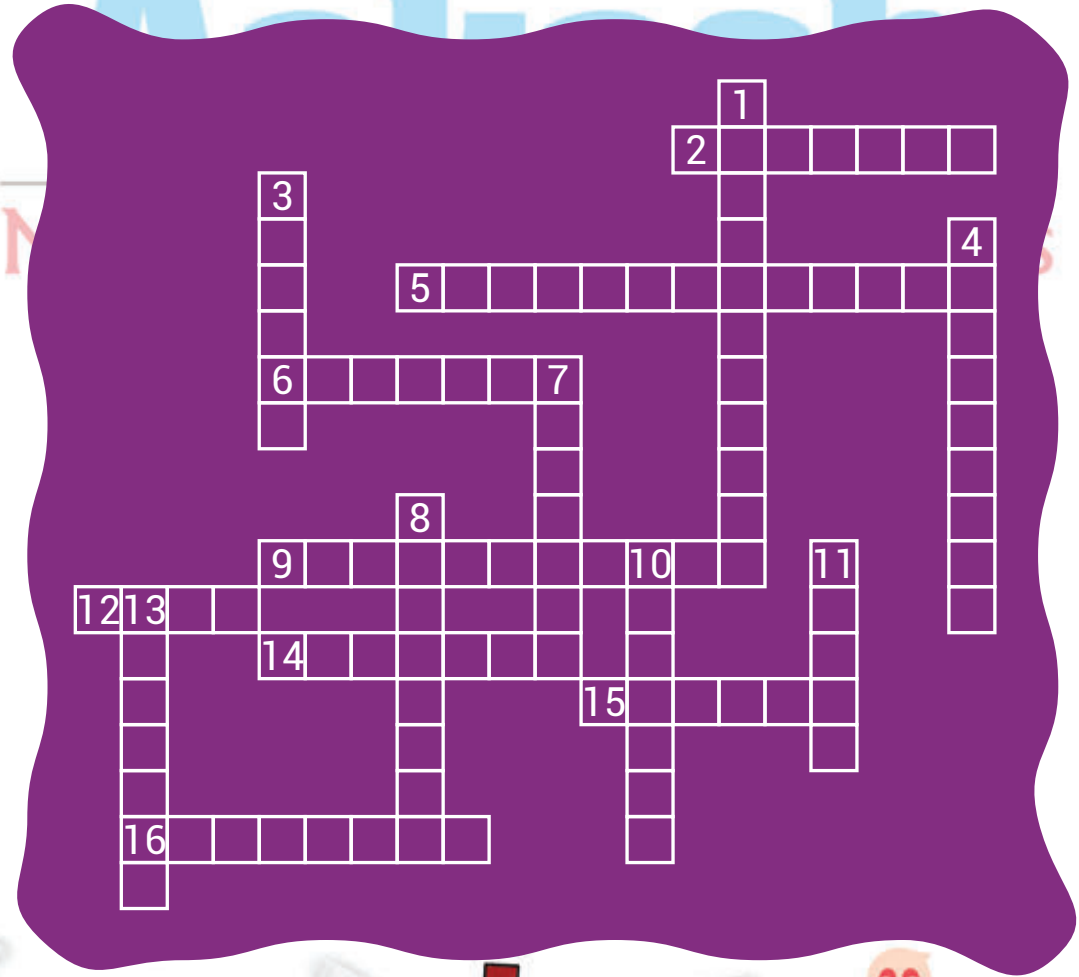
Considering its unique designs and historical significance it was designated as a UNESCO World Heritage Site in 1994.

Vocabulary

Crossword Puzzle

Solve the crossword using the list of words and the clues related to 'investigation'.

Infer	Inconceivable	Inquisitive	Analyze
Observe	Aspects	Inspect	Mental
Examine	Link	Conclude	Deduce
Revealed	Detective	Inquiry	Investigate



Across

2. A question
5. Unimaginable
6. To examine all the parts of something in order to understand it
9. To look into a situation (often a crime, but it can also be a mystery)
12. A connection; one part of a chain
14. To notice or watch
15. To figure out something unknown by considering all its known aspects and reasoning it through
16. To consider the evidence and then decide what is true or correct (Or to end something)

Down

1. Curious; wants to understand things
3. Related to the mind
4. A person whose job is to find or recognize the hidden information needed to solve a crime
7. To look closely at something
8. Shown or made known
10. Different sides or ways of looking at something
11. To make a logical guess that something is true based on the evidence, although the evidence is not clear enough to be absolutely certain
13. To look at something carefully to find problems or specific information

Jumbled Words Practice Questions

Instructions

In the following rows letters of words are jumbled up on the left hand side and a clue is given to help you re-arrange the letters to form a proper word.

Example

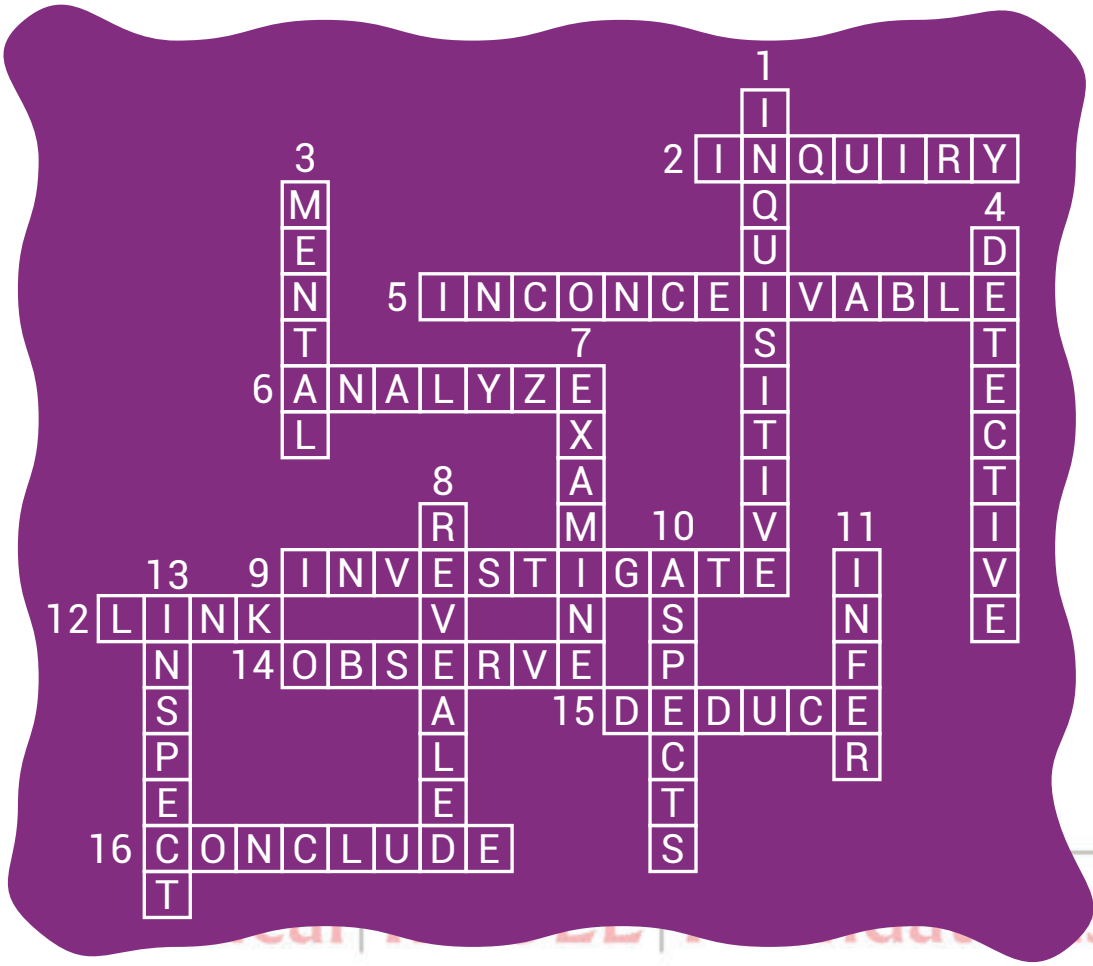
R S C U C I Clowns, elephants, horses, juggling _____

Answer

R S C U C I Clowns, elephants, horses, juggling **C I R C U S**

1.	O P T T A O	A kind of vegetable	
2.	O B E T L T	Drinks container	
3.	T C R O D O	Hospital worker	
4.	C R O T C U A L A L	Adding Machine	
5.	R M I N O T O	Computer screen	
6.	L A P E N	Air Transport	
7.	G M O A N	A kind of fruit	
8.	L S O A C M O S R	A place of study	
9.	R O T P O I N	A single serving	
10.	E P H A R C U S	Buy something	

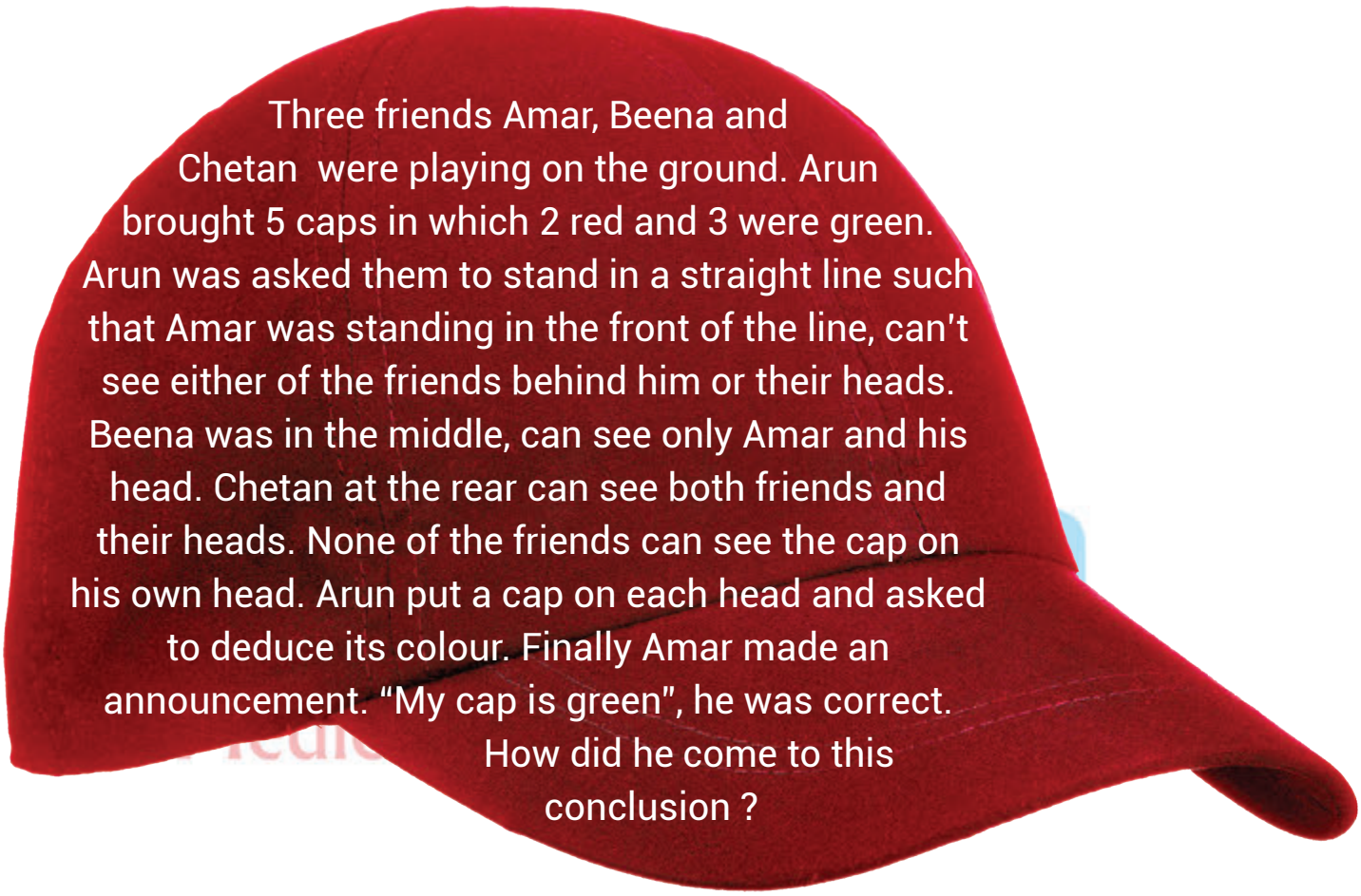
Answer (Crossword Puzzle)



Answer (Jumbled Words)

1. POTATO
2. BOTTLE
3. DOCTOR
4. CALCULATOR
5. MONITOR
6. PLANE
7. MANGO
8. CLASSROOM
9. PORTION
10. PURCHASE

Brainstormer



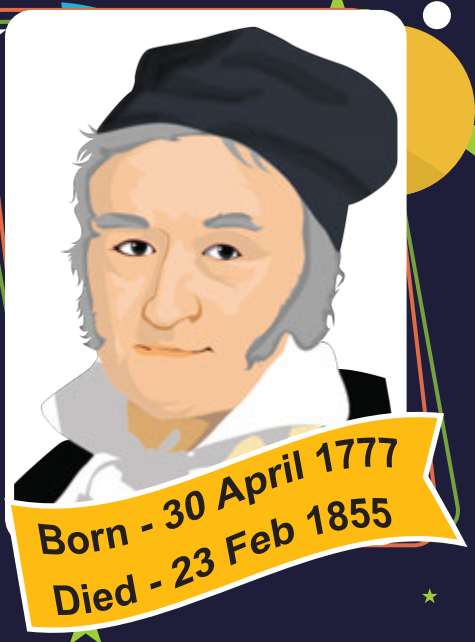
Three friends Amar, Beena and Chetan were playing on the ground. Arun brought 5 caps in which 2 red and 3 were green. Arun was asked them to stand in a straight line such that Amar was standing in the front of the line, can't see either of the friends behind him or their heads. Beena was in the middle, can see only Amar and his head. Chetan at the rear can see both friends and their heads. None of the friends can see the cap on his own head. Arun put a cap on each head and asked to deduce its colour. Finally Amar made an announcement. "My cap is green", he was correct. How did he come to this conclusion ?

Hints and Answers

If chetan sees two red caps, in front of him, he would immediately know his cap is green as there were only 2 red caps. His silence told the other two that at least one of them had a green cap. With that information,if the middle person saw a red infront of her she would know for sure that her cap is green. But if she saw a green cap she could not say any thing. Her silence thus told Amar that his cap is green.

Happy Birthday

Carl Friedrich Gauss



Carl Friedrich Gauss, original name Johann Friedrich Carl Gauss, (born April 30, 1777, Brunswick [Germany] - died February 23, 1855, Gottingen, Hanover).

German mathematician, generally regarded as one of the greatest mathematicians of all time for his contributions to number theory, geometry, probability theory, geodesy, planetary astronomy, the theory of functions, and potential theory (including electromagnetism).

Along with Archimedes and Newton, Gauss is undoubtedly one of the three geniuses in the history of mathematics.

OUR RESULTS 2024

NEET (UG) 2024

AIR 1

JEE (Advanced) 2024

1430 Students Scored Above MAS

344 Classroom Students Qualified in NSEs* 2023-24

- (Group A & B) 34+30 NSEA*
- 156 NSEB*
- 72 NSEC*
- 23 NSEP*
- 29 NSEJS*

Aakashians Qualified for INO-2024

Diptanshu Sharma	Priyanshu Sarkar	Mridul Garg	Zaman Hussain	Shubhradeep Paul	Samvit Shandilya
NSEB | NSEC | NSEP	NSEB | NSEC | NSEP	NSEB | NSEC | NSEP	NSEA | NSEC | NSEP	NSEA | NSEC | NSEP	NSEA | NSEC | NSEP

and many more...

*NSEA-National Standard Examination in Astronomy | NSEB-National Standard Examination in Biology | NSEC-National Standard Examination in Chemistry
NSEP-National Standard Examination in Physics | NSEJS-National Standard Examination in Junior Science | INO-Indian National Olympiad

Aakashians Qualified for OCSC/IMOTC-2024

32 Classroom Students Qualified in INOs 2024

Aneesh Shastri	Sanvi Jain	Mridul M Anand	Zaman Hussain	Sushant Agarwal	Archit Kumar
Qualified INAO	Qualified INChO	Qualified INBO	Qualified INMO	Qualified INJSO	Qualified INAO Jr

OCSCs - Orientation cum Selection Camps | **IMOTC** - International Mathematical Olympiad Training Camp

and many more...

Aakashians Qualified for RMO from Classroom Programs

869 Classroom Students Qualified in IOQM 2024

Class VIII Joish Achyuta	Class VIII Pranava NS	Class VIII Bruteshwar Rajguru	Class VIII Hardik Mishra	Class VIII Hardik Dhariwal	Class IX Dhanush Damu
2 Year Classroom	3 Year Classroom	3 Year Classroom	2 Year Classroom	2 Year Classroom	4 Year Classroom

IOQM - Indian Olympiad Qualifier in Mathematics

and many more...

Board Exam Results 2024

Top Performers from Class X

Devidyuti K Pisharody	P Harini	Jiya Dugar V
Marks 500/500	Marks 499/500	Marks 498/500
CBSE	CBSE	CBSE

and many more...

Top Performers from Class XII

Ananthan R	Ansh Agrawal	Himanshu Agarwal
Marks 496/500	Marks 495/500	Marks 495/500
CBSE	CBSE	CBSE

and many more...

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